IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Vishnu K. Agarwal	Attorney Docket No.	: 500431.04
Serial No.	: 09/910,661	Group Art Unit	: 1763
Filed	: July 20, 2001	Examiner	: George Goudreau

Title : METHOD AND APPARATUS FOR ENDPOINTING A CHEMICAL-MECHANICAL PLANARIZATION PROCESS

Box Non-Fee Amendment
Commissioner of Patents
Washington, D.C. 20231

DECLARATION UNDER 37 C.F.R. § 1.131

Sir:

I, Vishnu K. Agarwal, declare the following:

1. I am a named inventor on the above referenced patent application.

2. I have been employed as an engineer for Micron Technology since June 18, 1997.

3. Prior to September 4, 1997, I conceived of the apparatus for detecting the endpoint of a planarizing process of a microelectronic substrate which is claimed in the afore-mentioned patent application. More particularly, I conceived of directing slurry coming out of a planarization pad to a vaporizer using a pump along with an optional filter or diluter. The vaporized slurry is then analyzed for the species of interest in a mass spectrometer, and a change in slurry concentration as determined by the mass spectrometer is used for controlling the planarization process. Transport of the slurry from a drain line from the planarizing platen, vaporization, analysis and communication of the mass spectrometer results to the controller of the planarization process can take less than two seconds.

4. Prior to September 4, 1997, and within four days of conceiving of using a mass spectrometer to detect a change in slurry concentration and control a planarization process, I prepared Invention Disclosure Statement No. 97-800 which set forth the foregoing inventive idea. The invention disclosure statement was submitted to my employer, Micron Technology, Inc., for the purpose of preparing a patent application. The invention disclosure statement was thereafter submitted to patent counsel for preparation of the present application. A copy of the invention disclosure statement submitted to my employer and to patent counsel is attached hereto as Exhibit A.

5. The aforementioned statements based on my own knowledge are true and/or are based on information believed by me to be true. I acknowledge that willful false statements and the like are punishable by fine or imprisonment, or both, and may jeopardize the validity of the subject patent application or any patent issuing thereon.

Vishnu K. Agarwal

11/28/2001
Date

oject,
eck below:

vanced SRAM
BST
FED
FE RAM
NCAICM

INVENTION DISCLOSURE 97-800

INVENTOR(S): Vishnu K. Agarwal

DESCRIPTION

2.1 Title of invention:
A method for the on-line end point detection of CMP.

2.2 Brief description:
In this invention a method for the end point detection of CMP process is disclosed. A continuous sample of slurry, coming out of the pad, is directed to vaporizer using a pump/ pump and filter combination/ pump and dilution .The vaporized slurry is analyzed for the species of the interest in mass spectrometer. The change in slurry concentration as determined by the mass spectrometer is used for the controlling the process.

2.3 Also attach a complete description, including drawings or sketches and articles relevant to the invention. Legible photocopies of laboratory notebooks are acceptable.

Figure 1 shows the block diagram of the detection system after integration with the CMP tool. This figure also indicates the time taken in each step. The transport of the slurry from the drain line, vaporization, concentration analysis are performed and subsequently communicated with the controller on CMP tool in less than 2 second. This is continuous concentration monitoring hence no stabilization time is associated in region of interest as indicated in figure 2.

The concentration of W, Al, Cu and Si in slurry with various combination of removal rate and slurry flow rate is given in table 1. The data in this table show that the concentration level under various possible conditions is well within the capability of the mass spectrometer.

INFORMATION CONCERNING CONCEPTION OF INVENTION

3.1 CONCEPTION AND DOCUMENTATION OF THE INVENTION

FIGURE-1 : BLOCK DIAGRAM OF END POINT DETECTION SYSTEM USING VAPORIZER AND MASS SPECTROMETER

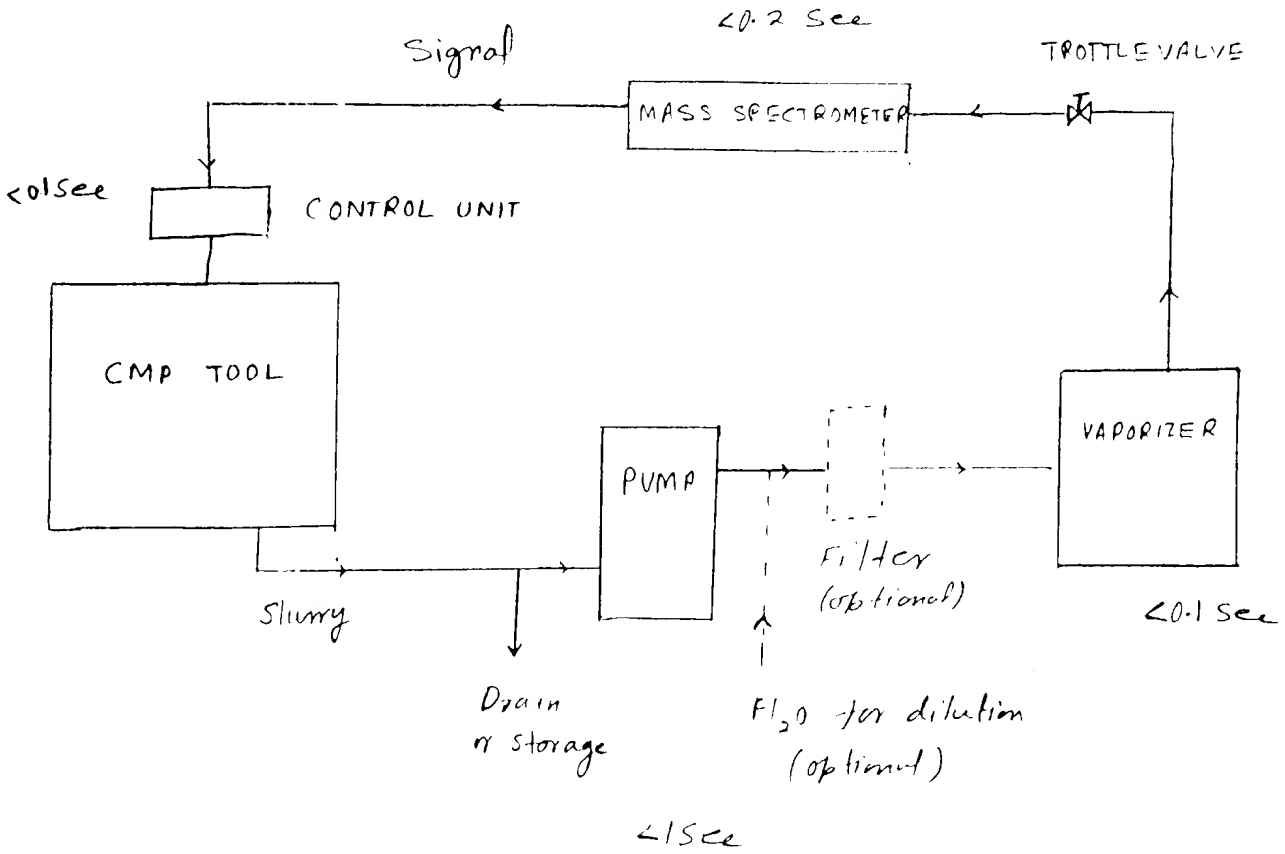

FIGURE-2 CHANGE IN CONCENTRATION DURING END POINT

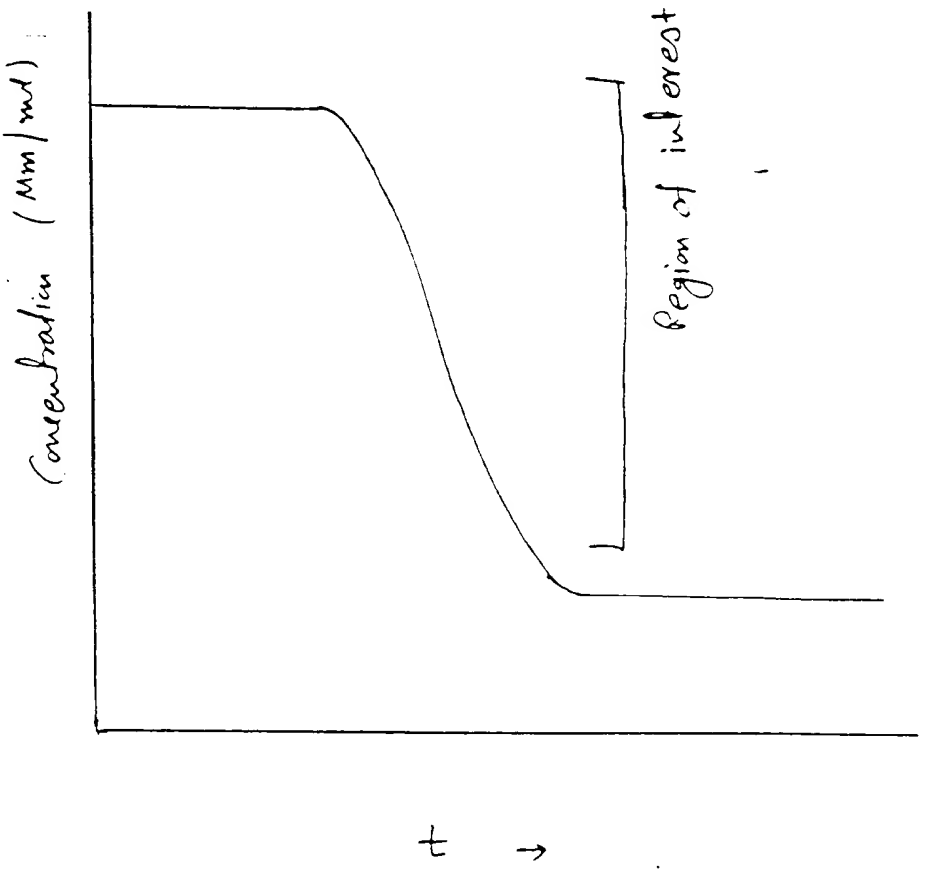

Table-1 : Concentration of various species under different processing conditions

Removal Rate (A/sec)	Slurry flow rate (ml/min)	Material being removed	Concentr (µg/ml)
10	10	W	1477.
10	500	W	29.5
10	10	Al	206.7
10	500	Al	4.13
10	10	Cu	682.9
10	500	Cu	13.6
10	10	Si	153.1
10	500	Si	3.06
100	10	W	14776
100	500	W	295.5
100	10	Al	2067.
100	500	AL	41.3
100	10	Cu	6829.
100	500	Cu	136.5
100	10	Si	1531.
100	500	Si	30.6

aption : Wafer Size is 8''

a. Identify the date when you first conceived the invention. (If not sure, give the earliest date of which you are sure.)

b. To whom was the idea first described and on what date? (Other than a co-inventor.)

Dr. Gurtej Sandhu,

c. Identify the date of the first tangible record such as computer simulation, tape out, drawing or written description. Please specify type and location.

.2 CONCEPTION OF THE INVENTION

a. Please identify related invention disclosures, patents or other publications describing similar ideas, and other companies working in the same field. Attach copies, if available.

No patent or publication mentioning this method for the CMP end point detection is not in my knowledge.

b. What is the closest technology, of which you are aware?

Chemical analysis method other than this method.

c. Identify the advantages of this invention over previous technology.

On line and real time analysis, The point of interest can find out and communicated in less than 2 sec.

Little time for development. The pump and vaporizer are available commercially used for DLI in CVD. The mass spetrometer is also available commercially from various manufacturer.

Compatiable with the clean room.

Can be used for any type of CMP and for various recipes.

Highly sensitive.

3.3 IMPORTANT DATES

a. Has the invention been disclosed outside the company? __No___ If yes, to whom, when, and in what form?

b. Have any articles describing your invention been published? No_____ If yes, list author(s), title of article, publication and date.

c. Have any engineering samples been given out? No_____ If yes, to whom and on what date?

d. Has any product using the invention been sold or offered for sale? _No____ If yes, to whom and on what date?

3.4 DISPOSITION OF THE INVENTION

a. When will (or did) Micron begin use of the invention

experimentally?

b. When will (or did) Micron begin production of this invention?

3.5 MISCELLANEOUS INFORMATION

a. Was the invention developed during a joint development agreement or other contract with an outside company? _No____

b. Please list developmental work outside of the company (including Government proposal or contract). Not applicable

INVENTORS:

ame: _Vishnu K. Agarwal_____

icron Phone: __82919_____ Micron Mail Stop: _306_____

ompany Name(VERY IMPORTANT): Dept. Name: Fab4/Diffusion/R&D_____
_X__ Micron Technology, Inc. Dept. #: _894G_____
___ Micron Electronics, Inc.
___ Micron Quantum Devices
___ Micron Display Technology, Inc.
___ Micron Communications, Inc.
___ Other_____

ome Address: _2463 E. Red Cedar Lane, _# 103_____

__Boise, ID-83716_____

itizenship: _____India_____

upervisor: _____Dr. Gurtej S. Sandhu_____

ignature: _____ Date: _ _____

Name: _____

Micron Phone: _____ Micron Mail Stop: _____

Company Name(VERY IMPORTANT): Dept. Name: _____
___ Micron Technology, Inc. Dept. #: _____
___ Micron Electronics, Inc.
___ Micron Quantum Devices
___ Micron Display Technology, Inc.
___ Micron Communications, Inc.
___ Other_____

Home Address: _____

_____

Citizenship: _____

Supervisor: _____

Signature: _____ Date: _____

Name: _____

Micron Phone: _____ Micron Mail Stop: _____

Company Name (VERY IMPORTANT): Dept. Name: _____
Dept. #: _____

___ Micron Technology, Inc.
___ Micron Electronics, Inc.
___ Micron Quantum Devices
___ Micron Display Technology, Inc.
___ Micron Communications, Inc.
___ Other _____

Home Address: _____

_____

Citizenship: _____

Supervisor: _____

Signature: _____ Date: _____

-- If more than three inventors use additional form(s) available in the Legal Department, 3rd floor, Administration building. --

5. WITNESS

If there is only one inventor, a witness should sign and date this disclosure. A witness in this case is a non-inventor who understands the nature of the invention.

Grant Ps C
_____ [redacted]
(Signature of Witness) (Date)

Note: If you have any questions or wish assistance completing this form, please call the Legal/Patent Department, ext. 4527.